User manual

Wireline WL76/57

Doc. no.: WL76/57e.06

SANDVIK

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1. Introduction

The Sandvik Wireline System (WL) is available in dimensions of 46, 56, 66 and 76 mm. There are two different versions of WL56, where the differences are primarily the weight of the drill rod and the inner dimension, which permit different core dimensions. The 66 and 76 mm dimensions include a triple variant with an extra inner tube.

Table 1: Different Wireline Systems

System	Hole dimension	Core dimension	Corearea in % of holearea	Tube ext./ int. dim.	Tube weight kg/m
WL46	Ø47.0	Ø28.8	37.5	Ø43.2/35.2	3.9
WL56/42	Ø56.8	Ø41.2	52.6	Ø53.2/47.2	3.8
WL66	Ø67.1	Ø50.5	56.6	Ø63.9/57.0	5.1
WL66-3	Ø67.1	Ø45	47.0	Ø63.9/57.0	5.1
WL76	Ø76.3	Ø57.5	56.8	Ø73.2/64.4	7.5
WL76-3	Ø76.3	Ø51	44.7	Ø73.2/64.4	7.5
WL103	Ø102.8	Ø80	60.9	Ø98/88.8	10.6

1.1 Description

WL76 is a thinwall Wireline System adapted to the metric system. This makes it possible to switch between the T, TT and WL Systems whenever necessary.

The WL System is intended to be used for drilling in all directions without the need for extra accessories. An overshot is used to obtain the best results from the system, which is designed to be pumped into the hole (see chapters “List of spare parts – Overshot for Pumping In 601 222 458” on page 25 and “Stuffing Box” on page 26). This overshot can be used in all directions, even with a high water pressure.

For recovery in drill holes inclined at an angle of more than 60° from the horizontal plane there is a free falling overshot (see chapter “Free Falling Overshot” on page 20), which is provided with wheels. The same overshot can be fitted with a special lowering device for use in downward holes with water loss, so-called dry holes.

The WL core barrels are available in lengths of 1.5 and 3.0 m, but can be extended to 4.5 and 6.0 m, please contact Sandvik for further information.

Drill bits for WL76 are manufactured as standard with an external diameter of 76.0 and reaming shell of 76.3 mm.

Remark

When drilling with an oversize bit and reaming shell an oversized drill rod connection should be used.

2. Safety Instructions

WARNING

When handling Wireline it is important to inspect the wire visually, since a broken wire can cause injury to personnel or damage the equipment. When the wire starts to look damaged it should be shortened.

WARNING

There is a risk of injury from the wire during Wireline drilling. This risk is greatest between the Wireline windlass and the top of the mast. Do NOT enter this area when the wire is in operation. There is also a risk of getting trapped round the drum, in the wire spreader on the drum, and at the pulley on the mast. Remember that the wire can split up, which can lead to severe cut injuries. Never grip the wire when it is in motion.

WARNING

When handling Wireline the inner tube can release on detachment and come sliding out of the hole at high speed.

WARNING

When the core barrel is emptied from the drill bit there is a risk of injuring the hands and fingers. The core can come sliding out from the core barrel at high speed. NEVER place the hands and fingers under the core barrel, place them is such a way that the core can pass without causing injury.

WARNING

The drill rods are exposed to a higher load and heavier vibrations during upward drilling. The risk of drill rods braking when they are worn is therefore increased. If the rods break during the drilling the rod holder will be open, which causes the rod string to slide out from the hole. For this reason, place the panel at a safe distance from the barrier.

WARNING

The risk of injury increases more than normal during upward drilling.

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WARNING

Cuff wrenches must under NO CIRCUMSTANCES be used on the rods when they are rotated by means of the machine. They can come loose and injure the operator, or cause pinch injuries on the hands and fingers.

WARNING

Remember to secure the machine in a reliable manner when it is anchored to the rock. Make sure to inspect the attachment during operation to make sure the machine does not come loose.

WARNING

Remember that you should have the opportunity to reach, or have regular contact with those around you if you should become injured when using the machine.

2.1 Recommendations

- Check the threads on the drill rods regularly. If the threads are damaged they can damage other rods they are attached to. Pay extra attention to the water swivel tube.
- Make sure that the threads are properly engaged with each other before the rods are screwed together by means of the machine.
- Make sure that the rod does not break during threading (rod support and guides).
- Make sure to lubricate the threads.

Note

Always lubricate the drill rod threads with grease that is suitable for high pressure. Special thread lubricant is best.

- Avoid rotating so fast that the threads are “knocked” together.
- Check that the threads are free from dirt and undamaged.
- The continuous feed pressure should not exceed 3.5 tons.
- Avoid too many tough shapening. Use a lower water flow instead for hard rock.
- Make sure that lifting function on the machine functions during the rod threading, and that the “float position” works.
- If the threading on one rod should get damaged during making of joint, both rods should be replaced.

2.2 Wire Handling

2.2.1 Winding of wire

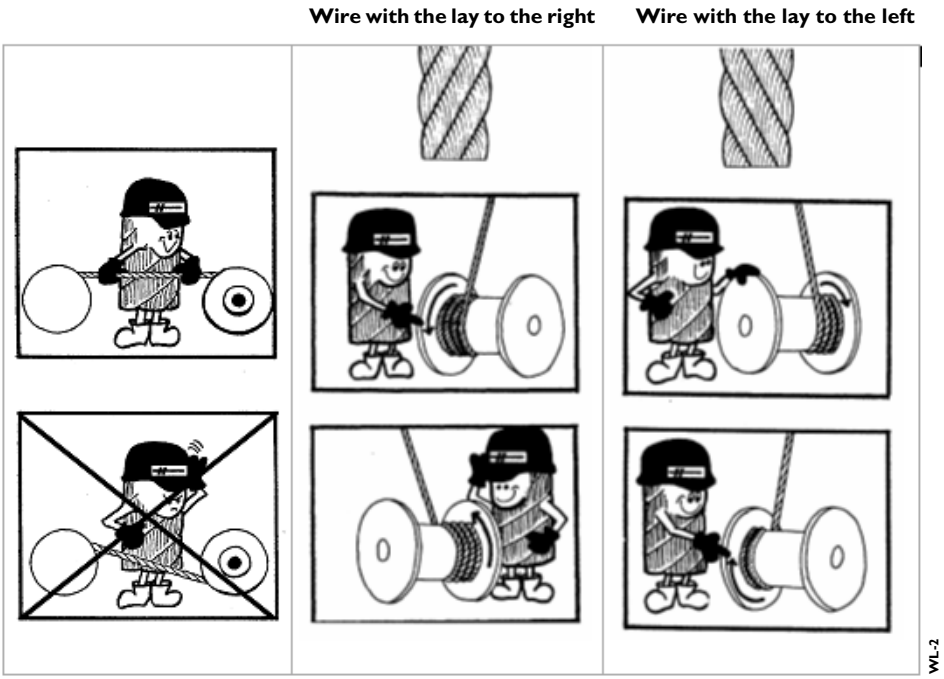


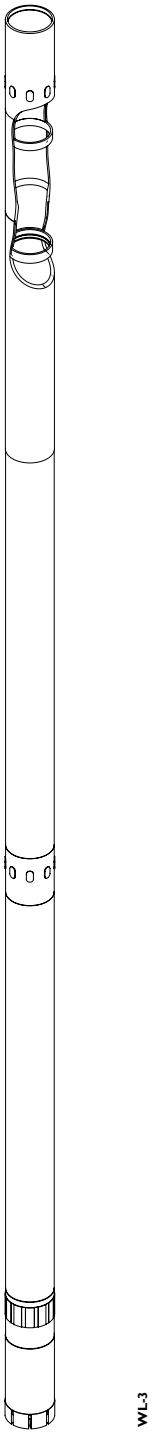
Figure 1. Wire handling

3. Outer Core Barrel, complete

The numbers bellow correspond against the numbers in table “List of spare parts, Outer Core Barrel, WL76” on page 9.

The core barrel drill rod adaptor (1) has tungsten carbide inserts so that it can be guided up and therefore minimize the hole deviation.

3.1 Fitting of Outer Core Barrel



The outer landing ring (4) is fitted in the adapter tube’s (5) female thread, with the internal collar facing upwards.

The latch housing (3) locks the landing ring (4).

Remark

The landing ring should be replaced after drilling approximately 500 m.

The latching ring (2) is fitted on the latch housing’s (3) female thread.

The drill rod adaptor (1) locks the latching ring.

The latching ring can be reversed after a period of use if the edge has become worn.

When extending the core barrel an outer tube coupling (6) or a reaming shell (9) is fitted between the outer tubes.

The outer tubes are of standard lengths 1.5 m or 3.0 m (see table “Extendable Outer Core Barrel WL76” on page 9).

On those occasions when the outer tube is taken up for inspection a careful check should be made that the outer landing ring and latching ring are in place and undamaged.

The inner tube is locked upwards in the outer tube in that the core barrel head latches support the latching ring. The inner tube is fixed downwards in that the outer landing ring has a smaller diameter than the core barrel head’s landing ring.

The tensile force when breaking the core is transferred from the core lifter case to the drill bit in that the inner tube connection is flexible in the axial plane (the core lifter case “rests” on the bit). The play between drill bit and core lifter case can be adjusted for different types of drilling.

Before recovery the core is broken and the core barrel lifted 3-6 m. This prevents drill cuttings that drop back into the hole collecting inside the outer tube.

The core barrel can be equipped with a harder outer tube: 601 222 652 (3 m).

3.2 List of spare parts – Outer Core Barrel

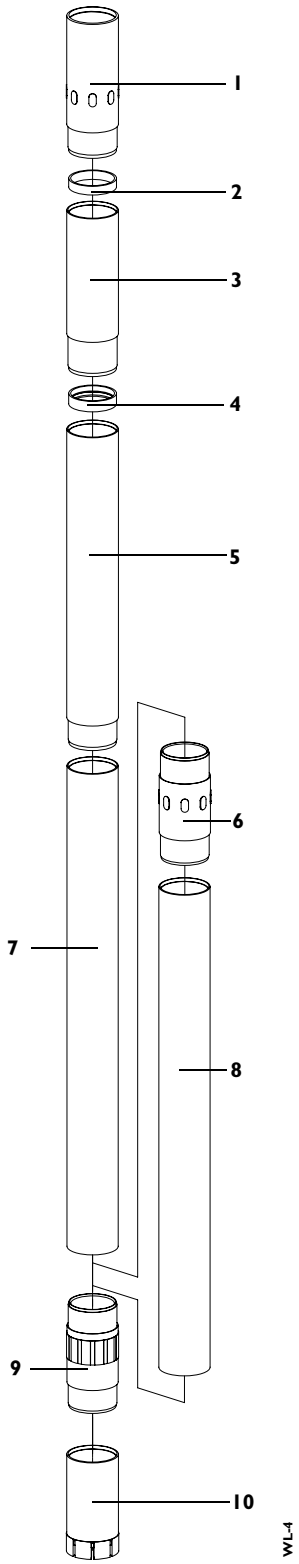


Table 2: List of spare parts, Outer Core Barrel, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Drill rod adaptor, right-hand		601 222 432
2	1	Latching ring		601 222 433
3	1	Latch holder		601 222 434
4	1	Outer landing ring		601 222 435
5	1	Adaptor tube	L = 260 mm	601 222 483
6	**	Outer tube coupling		501 220 133
7	*	Outer tube, 1.5 m	L = 1552 mm	501 220 116
7.1	*	Outer tube, 3.0 m	L = 3052 mm	501 220 117
8	*	Extension tube, outer tube, 1.5 m	L = 1552 mm	501 220 116
8.1	*	Extension tube, outer tube, 3.0 m	L = 3052 mm	501 220 117
9	1	Reaming shell		
10	1	Drill bit		

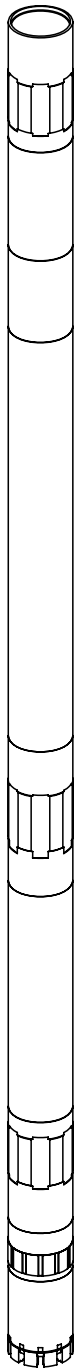
* Standard outer tube (7) also used as extension tube (8).

** The outer tube coupling can be replaced with a reaming shell.

Table 3: Extendable Outer Core Barrel WL76

Length (m)	Quantity	Outer tube standard	Quantity	Extension tube outer tube	Part no. compl. tube
1.5	1	501 220 116	-	-	601 222 610
3.0	1	501 220 117	-	-	601 222 611
4.5/2	1	501 220 117	1	501 220 116	601 222 612
6.0/2	1	501 220 117	1	501 220 117	601 222 613

4. Outer Core Barrel with guides, Complete



The numbers bellow correspond against the numbers in table “List of spare parts, Outer Core Barrel, WL76” on page 9.

Now there is a core barrel with special guides when straightness demands are made on the holes.

Landing ring, outer tube and latching ring are assembled in the same way as on other core barrels.

Note

There are two types of adapter tubes available, depending on the length of core barrel used. See the table.

This tube is suitable for both standard inner tubes and triple inner tubes. When drilling with the triple system it is only the drill bit that needs to be replaced.

The outer landing ring (4) is fitted in the adapter tube’s (5) female thread, with the inner recess facing upwards.

The latch housing (3) locks the landing ring (4) in position.

Remark

The landing ring should be replaced after approximately: 500 m of drilling.

The latching ring (2) is fitted in the latch housing (3) female thread.

The drill rod adapter (1) locks the latching ring.

The latching ring can be turned after a period of use if the edge becomes worn.

On those occasions the outer tube is taken up for inspection a careful check should be made that the outer landing ring and latching ring are in place and undamaged.

The inner tube is locked upwards in the outer tube through the core barrel head latches support the latching ring. The inner tube is fixed downwards in that the outer landing ring has a smaller diameter than the core barrel head’s landing ring.

The tensile force when breaking the core is transferred from the core lifter case to the drill bit as the inner tube connection is flexible in the axial plane (the core lifter case “rests” on the bit). The play between drill bit and core lifter case can be adjusted for different types of drilling.

Before recovery the core is broken and the core barrel lifted 3-6 m. This prevents drill cuttings that drop back into the hole collecting inside the outer tube.

4.1 List of spare parts – Outer Core Barrel with guides

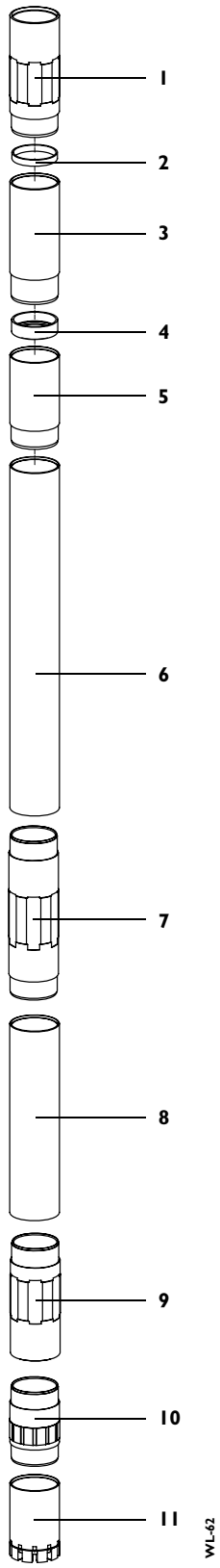


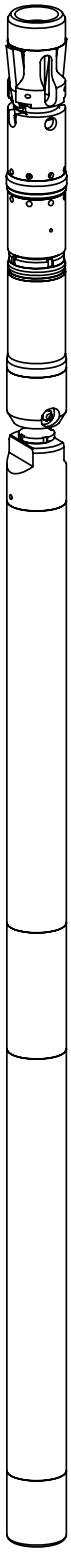
Table 4: List of spare parts, Outer Core Barrel, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Drill rod adaptor		601 222 432-1
2	1	Latching ring		601 222 433
3	1	Latch holder		601 222 434
4	1	Outer landing ring		601 222 435
5	1	Adaptor tube	L=260 mm	601 222 483
5.1	1	Adaptor tube	L=143 mm	601 222 603
6	*	Outer tube, 1.5 m	L=1552 mm	501 220 116
6.1	*	Outer tube, 3.0 m	L=3052 mm	501 220 117
7	1	Intermediate coupling		601 222 546
8	*	Extension tube, outer tube, 1.5 m	L=1272 mm	601 222 604-1
8.1	*	Extension tube, outer tube, 3.0 m	L=2772 mm	601 222 604-2
9	1	Calibration guide		601 222 548-1
10	1	Reaming shell		
11	1	Drill bit		

Table 5: Outer Core Barrel with guides, WL76

Length (m)	Quantity	Inner tube standard	Adaptor tube	Quantity	Extension tube outer tube	Part no. compl. tube
3.0	1	501 220 116	601 222 603	1	601 222 604-1	601 222 605
4.5/2	1	501 220 117	601 222 483	1	601 222 604-1	601 222 606
6.0/2	1	501 220 117	601 222 483	1	601 222 604-2	601 222 607

5. Inner Core Barrel, complete



A standard inner tube is used to extend the inner tube (see table “Extendable Inner Core Barrel, WL76” on page 13).

The numbers bellow correspond against the numbers in table “List of spare parts, Inner Core Barrel, complete, WL76” on page 13.

Always use cuff wrenches when working with the inner tube (2) and core lifter case (6). Check the function of the core lifter spring (5) after each recovery. If the inner tube is clamped oval, or otherwise damaged, the inner tube can stick in the drill rod or outer landing ring. A landing ring for the core barrel head can be used to check that the inner tube has not been deformed.

Table 6: Estimated times for pumping in Inner Core Barrel, WL76

System	Volume drill rod	Speed with water flow of 40 l/min.	Time to 100 m with water flow of 40 l/min.
WL46/29	1.0 l/m	40 m/min.	2.5 min.
B60	1.6 l/m	25 m/min.	4 min.
WL56/42	1.7 l/m	24 m/min.	4 min.
WL66/45	2.6 l/m	16 m/min.	6 min.
WL66/50.5			
WL76/51	3.3 l/m	12 m/min.	8 min.
WL76/57.5			

The pumping in time for the inner core barrel is part of the total handling time. If the Sandvik System with pumping of the inner tube or lifter is used it is possible to obtain an indication of when they are in position. This ensures significant time savings since the drilling or recovery of the inner core barrel can be started immediately. How long the pumping takes depends on how much water can flow in the gap between the core barrel and hole wall. This time can be reduced by increasing the pressure of the water, or increasing the gap between the drill rod and hole wall. If the gap is increased between the drill rod and hole this increases the risk of deviated holes.

5.1 List of spare parts – Inner Core Barrel, complete

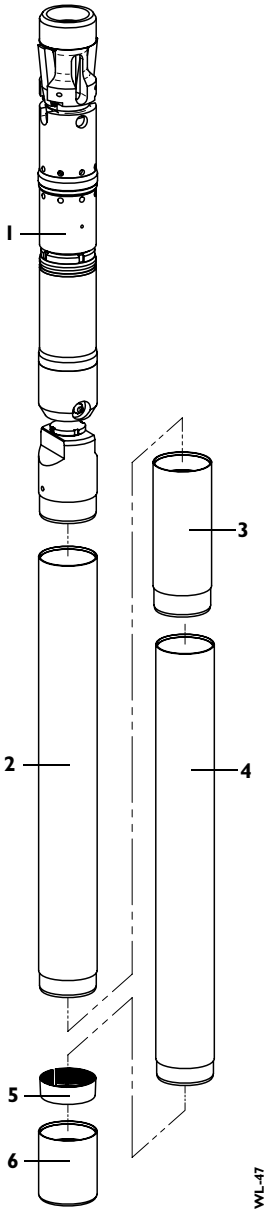


Table 7: List of spare parts, Inner Core Barrel, complete, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 595
2	*	Inner tube 1.5 m	L = 1475 mm	601 222 450
2.1	*	Inner tube 3.0 m	L = 2975 mm	601 222 437
3	1	Spacer tube	L = 142 mm	601 222 585
4	*	Extension tube, inner tube 1.5 m	L = 1475 mm	601 222 450
4.1	*	Extension tube, inner tube 3.0 m	L = 2975 mm	601 222 437
5	**	Core lifter spring, standard		601 222 439
6	1	Core lifter case		601 222 438

* Standard inner tube (2) can also be used as extension tube (3).

** Core lifter spring can also be found in flatt mode 601 222 439-2.

Table 8: Extendable Inner Core Barrel, WL76

Length (m)	Quantity	Inner tube standard	Quantity	Extension tube inner tube	Part no. compl. tube
1.5	1	601 222 450	-	-	601 222 614
3.0	1	601 222 437	-	-	601 222 615
4.5	1	601 222 437	1	601 222 450	601 222 616
6.0	1	601 222 437	1	601 222 437	601 222 617

6. Inner Core Barrel complete triple 51 core

Sandvik's WL76 triple system gives a core of Ø51 mm. The system requires a special inner tube for this. It is possible to extend the inner tube with the help of a connector and a triple inner tube. (see the table "Extendable Inner Core Barrel, WL76" on page 13).

The numbers bellow correspond against the numbers in table "List of spare parts – Inner Core Barrel, complete, triple" on page 15.

Always use ring pliers when working with the inner tube (2) and core lifter case (7). Check the function of the core lifter spring (6) after each extraction. Should the inner tube become deformed or damaged in any other way it can jam in the drill tube or in the outer landing ring. A landing ring on the core barrel head can be used to check that the inner tube has not become deformed.

Note

When assembling the core lifter spring in the core lifter case, a spacer with the bevel facing forwards after the spring is fitted in the case.

When emptying the inner tube, the core lifter case is screwed off and a hose with a snap-on coupling is easily connected on the inner tube connection. The split liner with core is then pumped out. (see the table "List of spare parts for handling equipment triple, WL76" on page 18).

The system can be used with front flushed or non front flushed bits. Different core lifter cases should be used.

6.1 List of spare parts – Inner Core Barrel, complete, triple

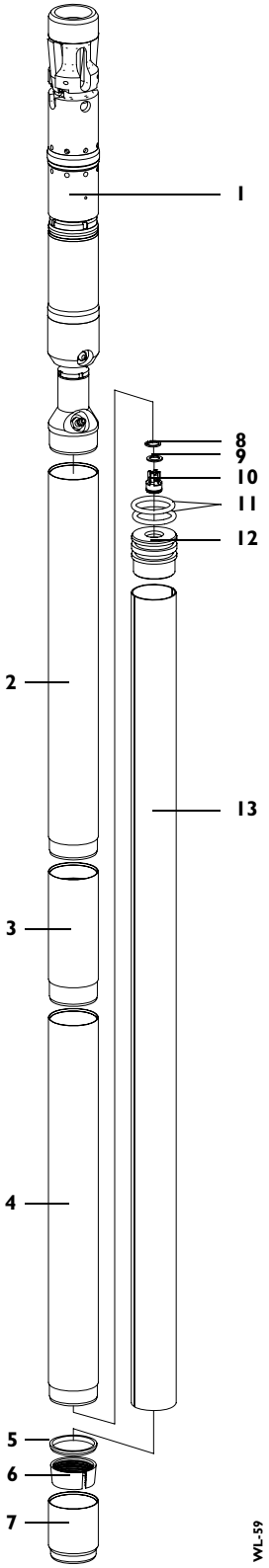


Table 9: List of spare parts Inner Core Barrel, complete, triple, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 602
2	*	Inner tube 1.5 m	L=1475 mm	601 222 591-1
2.1	*	Inner tube 3.0 m	L=2975 mm	601 222 591-2
3	1	Connector	L=142 mm	601 222 593
4	*	Extension tube, inner tube 1.5 m	L=1475 mm	601 222 591-1
5	1	Spacer		601 222 597
6	1	Core lifter spring		601 222 598
7	1	Core lifter case		601 222 599
7.1	1	Core lifter case, front flushed		601 222 600
8	1	Latching ring		300 027 151
9	1	Support ring		300 027 152
10	1	Non-return valve		300 022 763
11	2	O-ring	44.2x5.7	300 010 705
12	1	Piston		601 222 601
13	*	Inner tube steel divided	L=1440 mm	601 222 592-1
13.1	*	Inner tube steel divided	L=2940 mm	601 222 592-2
13.2	*	Inner tube steel divided	L=4557 mm	601 222 592-3

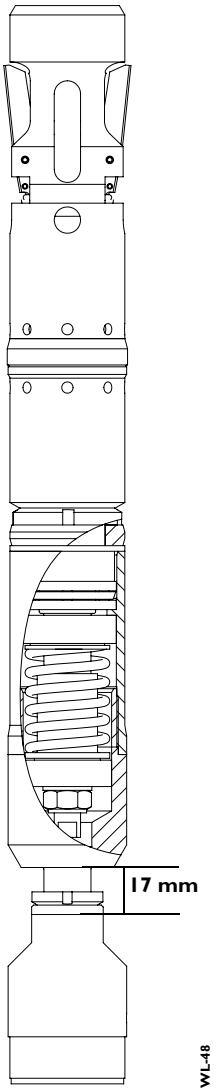
Table 10: Extendable inner core barrel triple, WL76

Length (m)	Pcs	Inner tube 601 222	Pcs	Extension tube 601 222	Pcs	Inner tube steel divided	Part no. compl. tube
1.5	1	591-1	-	-	1	601 222 592-1	601 222 618
3.0	1	591-2	-	-	1	601 222 592-2	601 222 619
4.5	1	591-2	1	591-1	1	601 222 592-3	601 222 620

Note

Complete inner tube triple is equipped with non front purged core lifter case as standard.

7. Core Barrel Head



Core barrel head has part no. 601 222 595. For the Triple system the standard core barrel head can be used by changing the inner tube connection. The triple core barrel head has part no. 601 222 602.

The numbers bellow correspond against the numbers in table “List of spare parts, Core Barrel Head, WL76” on page 17.

Check that the latches (2) move freely and that the O-ring (1) and tubular pins (3 and 4) are undamaged.

When checking the latches the lifter tip is inserted in the core barrel head. The back edge of the lifters should then be inside the outer dimension of the latch housing. If not, the tubular pin is probably crooked or the hole in the latch worn.

When fitting the release valve (9) the spring (10) must be turned with the rivet from the release valve.

Note

Make sure that the cylindrical pin (11) does not catch in the thread and can easily be moved in its slot.

Note

Lubricate the core barrel head with grease every time it is taken up.

Use enough grease to ensure that fresh grease is pressed out through the bearing housing (18). Oil in the release valve through the hole at the landing ring (7). Wipe off all surplus grease.

If the release valve jams there is a reamer (part no. 300 025 325) to clean the release valve seat.

The landing ring core barrel head is fitted so that the hole is turned backwards on the valve housing (12). Fit the latch housing (5) [with spacer washer (6)] on the valve housing, and tighten. Screw the landing ring core barrel head to the latch housing, and tighten. It will now function as a lock nut.

When fitting the bearing unit it should be noted that the thrust ball bearing (17) must be turned correctly for the grease to pass through the bearing. The special tool 601 222 484-2 is used at disassembly and assembly of bearing.

Note

The thrust ball bearing (17) washers have different hole diameters. The washer with the smallest hole diameter is fitted upwards.

To optimize drilling in different types of rock it may be necessary to adjust the gap between the bit and core lifter case. This is done be releasing the lock nut on the inner tube connection (29) and adjusting the gap between the inner tube connection (29) and the lower bearing housing (26).

The recommended setting is 17 mm.

7.1 List of spare parts – Core Barrel Head 601 222 595

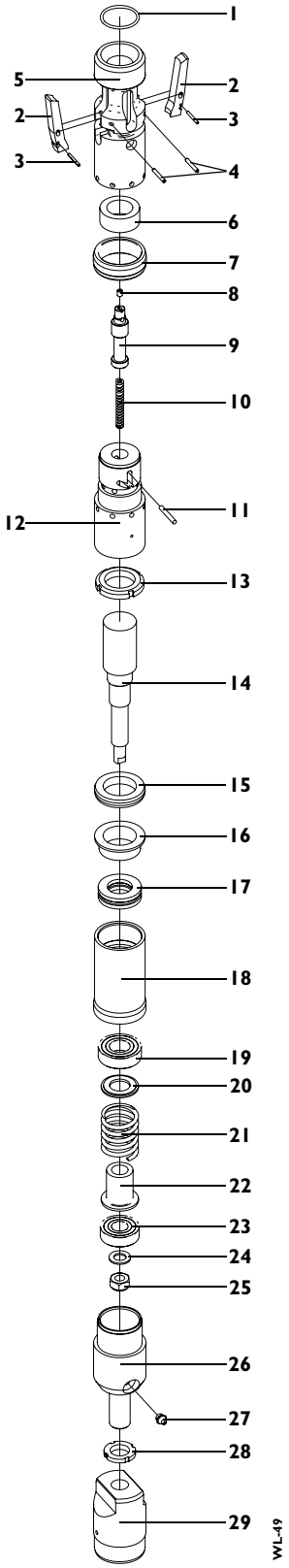
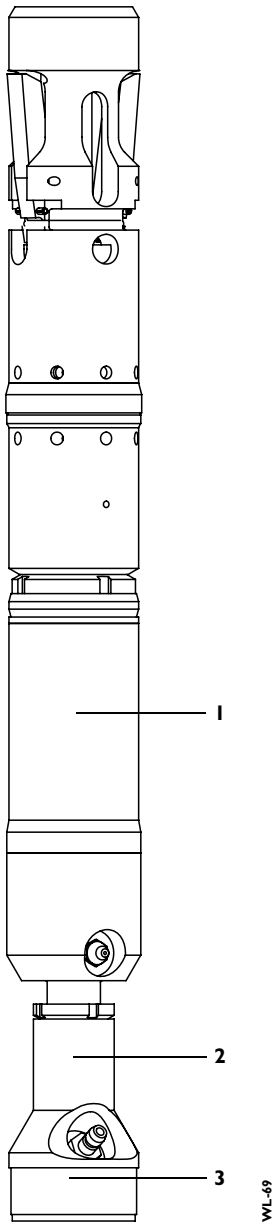


Table 11: List of spare parts, Core Barrel Head, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	O-ring	44.2 x 3.0	300 012 693
2	2	Latch		601 222 419
3	2	Tubular pin	3.0 x 26	300 015 310
4	2	Tubular pin	4.0 x 30	300 015 967
5	1	Latch housing		601 222 418
6	1	Spacer		601 222 420
7	1	Landing ring core barrel head		601 222 431
8	1	Stop screw		300 012 530
9	1	Release valve		601 222 421
10	1	Spring		601 222 378
11	1	Cylindrical pin		300 022 671
12	1	Valve housing		601 222 422
13	1	Nut	KM 8	300 013 339
14	1	Shaft		601 222 423
15	1	Spacer		601 222 424
16	1	Washer		601 222 425
17	1	Thrust ball bearing		300 027 105
18	1	Upper bearing housing		601 222 426
19	1	Radial ball bearing		300 013 529
20	1	Washer		601 222 427
21	1	Spring		300 027 104
22	1	Bushing		601 222 428
23	1	Radial ball bearing		300 020 610
24	1	Washer		300 012 556
25	1	Nut		300 012 513
26	1	Lower bearing housing		601 222 429
27	1	Grease nipple		300 015 242
28	1	Nut	KM 5	300 013 333
29	1	Inner tube connection		601 222 594

7.2 List of spare parts – Core barrel head triple 601 222 602



When using the triple the same core barrel head is used, but with the difference that the inner tube connection is replaced.

Table 12: List of spare parts, Core Barrel Head, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Core barrel head		601 222 595
2	1	Inner tube connection triple		601 222 596
3	1	Snap-on coupling male		300 027 153

The parts below are used to pump out the core

Table 13: List of spare parts for handling equipment triple, WL76

No.	Quantity	Part	Remarks	Part no.
	1	Snap-on coupling female		300 027 154
	1	Adaptor		300 027 168
	1	Hose		300 027 169
	1	Adaptor		300 020 350

8. Functional description for pumping

In the core barrel head there is a release valve, which before pumping in should be locked in a special pumping position. Insert a screwdriver in the latch housing, press the release valve forward and turn a quarter of a turn. The release valve will now be locked in its pumping position and the pumping in of the inner tube can now be started. When the inner tube is in position the water pressure increases powerfully and the flow of water is stopped. This is an indication that the inner tube is in it locked position. With the retention of the high water pressure for a few seconds the release valve will be pressed forward and released from its locked position.

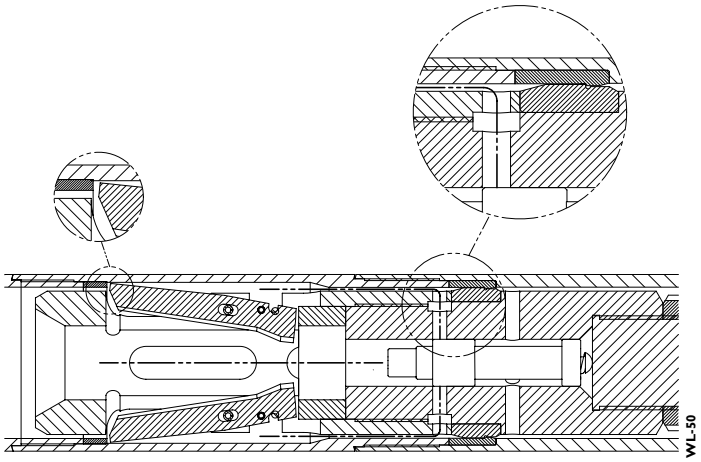


Figure 2. Core barrel head

After the pump flow has been stopped and the water pressure completely drained, the spring will press the release valve upwards. This forms a free passage for the flushing water, and the pumping for the drilling can be started.

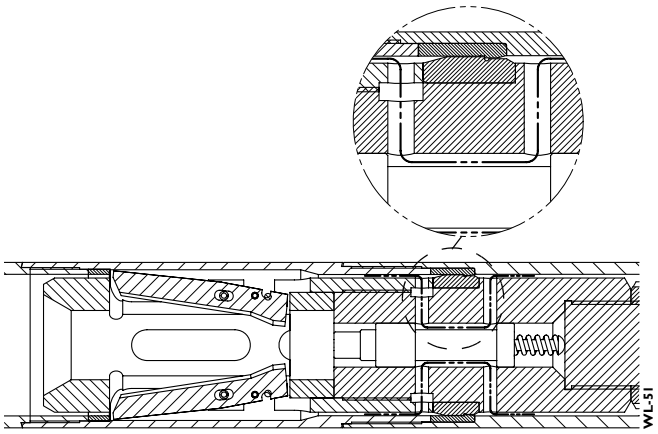


Figure 3. Core barrel head

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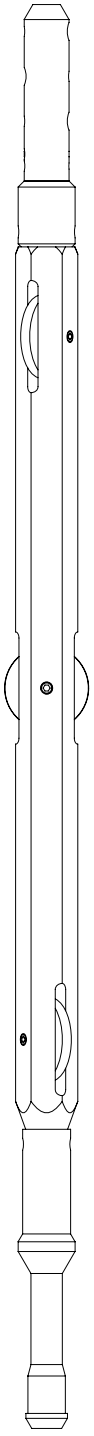
9. Free Falling Overshot



Free falling overshot has part no. 601 222 685.

The overshot has a swivel (1, 4, 6) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approx. 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

Remark

When double shear pins are fitted the breaking point load increases to approx. 3 tons.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

Fit the bearing shaft (6) in the bearing housing (4), then fix the wire clamp (1) on the bearing shaft (6) by means of the [shear pin (s) (3)]. Lubricate the surfaces between bearing housing and wire clamp with grease. The bearing housing is then filled with grease before it is fitted on the wire weight by means of the tubular pin (5).

The shear pins should be replaced at regular intervals.

When the lifting tip (10) is led down in the core barrel head the latches are released from the latching ring. When the tip has passed the latches the inner tube is locked to the overshot, and the inner tube can be winched up by means of the wire.

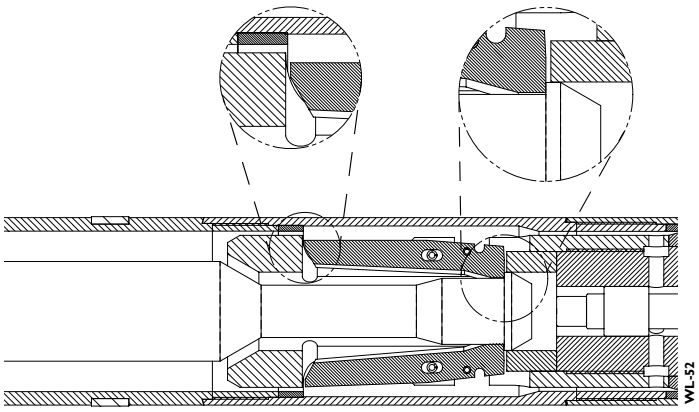


Figure 4. Core barrel head

Note

The lifting tip should be replaced when the edge of the lifting tip begins to be worn.

The lifting tip can if necessary be provided with a joint by fitting a ball joint (See table “List of spare parts, Ball joint 601 222 462” on page 21) between the lifting tip (10) and wire weight (9).

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9.1 List of spare parts – Free Falling Overshot 601 222 685

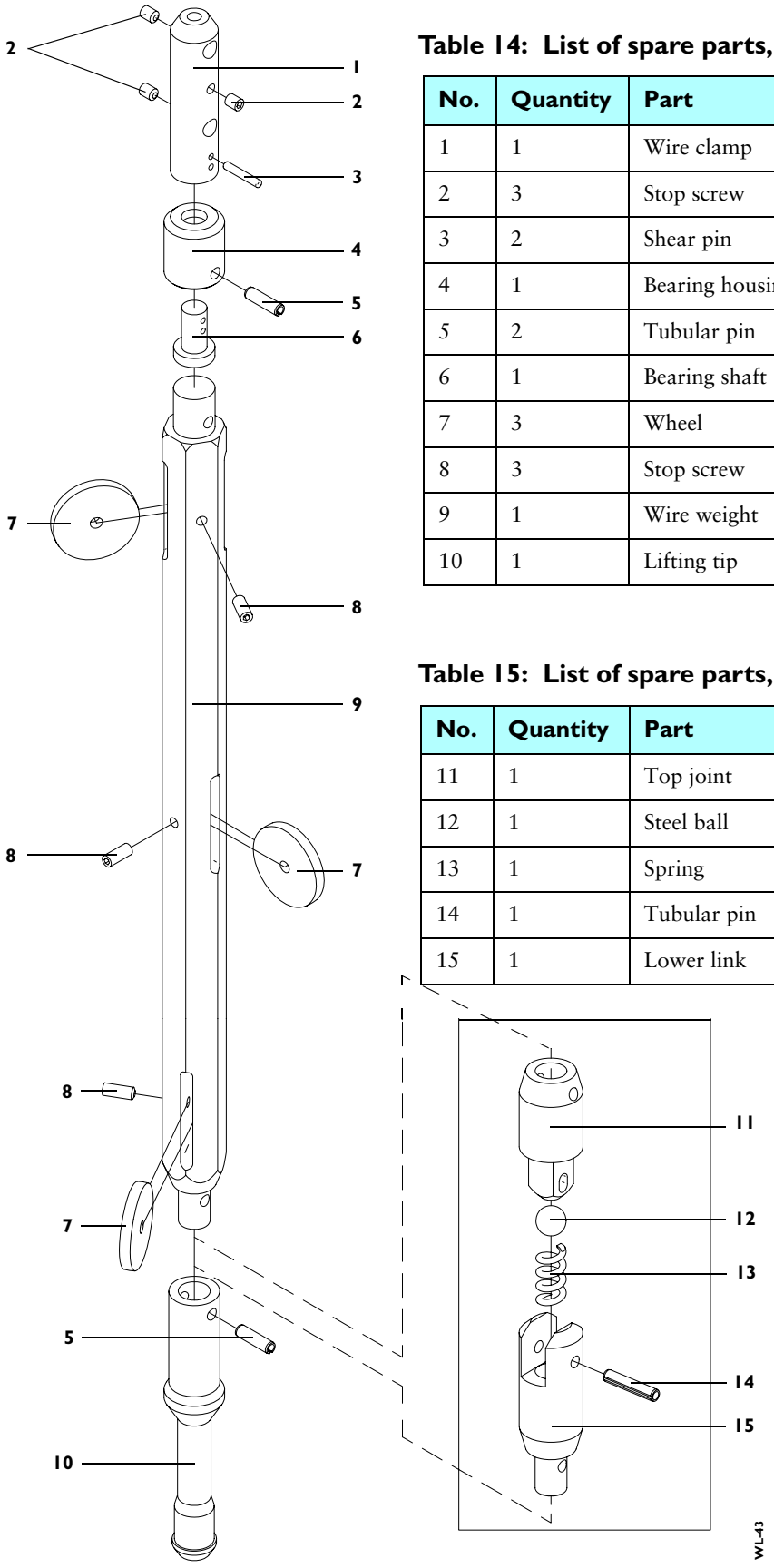


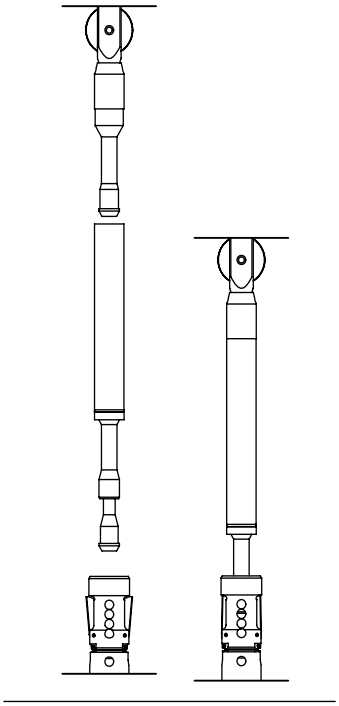
Table 14: List of spare parts, Free Falling Overshot

No.	Quantity	Part	Part no.
1	1	Wire clamp	601 222 692
2	3	Stop screw	300 027 148
3	2	Shear pin	300 025 423
4	1	Bearing housing	601 222 688
5	2	Tubular pin	300 015 732
6	1	Bearing shaft	601 222 693
7	3	Wheel	601 222 441
8	3	Stop screw	300 010 699
9	1	Wire weight	601 222 687
10	1	Lifting tip	601 222 440

Table 15: List of spare parts, Ball joint 601 222 462

No.	Quantity	Part	Part no.
11	1	Top joint	601 222 452
12	1	Steel ball	300 027 125
13	1	Spring	300 027 124
14	1	Tubular pin	300 015 949
15	1	Lower link	601 222 463

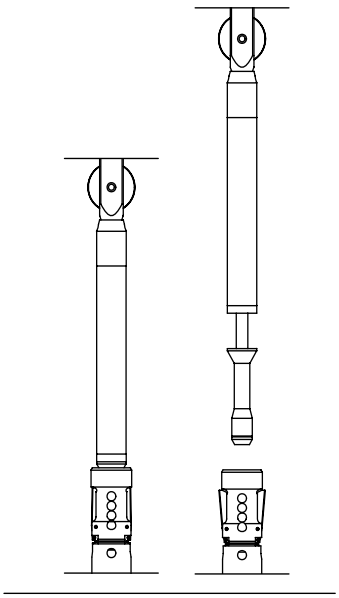
10. Safety Lowering Device for Dry Holes 601 222 448



If a hole is dry, a Safety Lowering Device (SLD) should be used to install the inner core barrel assembly into the outer core barrel. This is to avoid high velocity impacts between inner and outer core barrel that may result in damaged equipment.

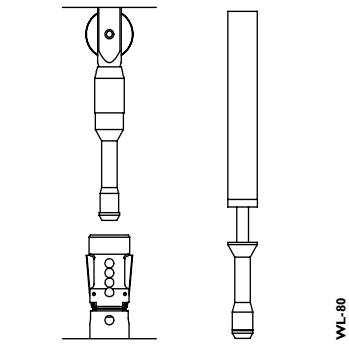
How to assemble and use the SLD:

1. Screw the Extension socket (1) on the thread on the overshot lifting tip.
2. Lock the Sleeve (4) in upper position by holding the SLD-lifting tip and moving the Sleeve fully backwards.
3. Connect the SLD to the core barrel head of the Inner tube assembly. When the SLD-lifting tip has passed beneath the latches, the inner tube assembly is locked to the SLD.
4. Lower the inner tube assembly into the drill string by means of the overshot.



When the inner tube assembly comes to a halt on the outer landing ring, the overshot will press the Sleeve (4) forward. This will release the latches from the Lower SLD-lifting tip.

When the overshot is pulled upwards, the Sleeve will stay in lower position, enabling the latches to fold out and lock against the latching ring. The overshot can now be hoisted to surface and drilling can begin.



When retrieving the inner tube assembly after a completed run, the SLD is removed from the overshot lifting tip and the overshot is hoisted down the drill string as usual.

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10.1 List of Spare Parts – Safety Lowering Device for Dry Holes 601 222 448

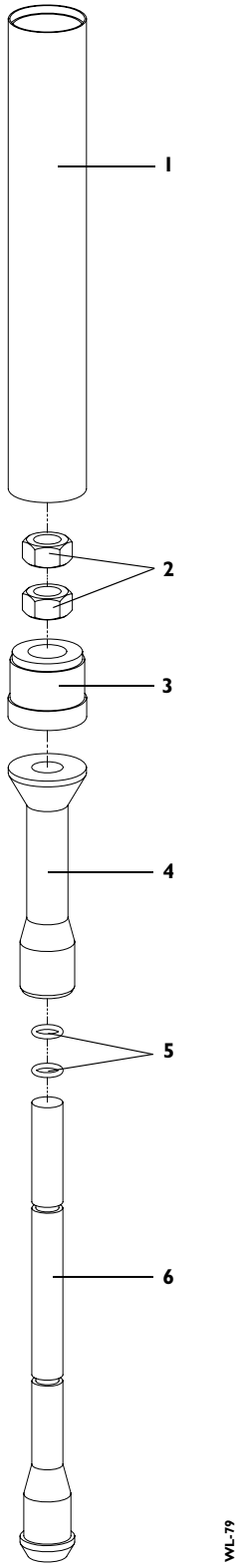
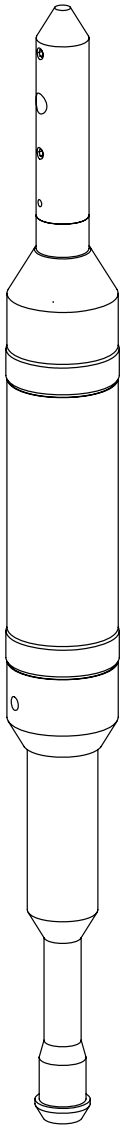


Table 16: List of Spare Parts, Safety Lowering Device for Dry Holes

No.	Quantity	Part	Remarks	Part no.
1	1	Extension sleeve		601 222 474
2	2	Nut	M6M M16	300 012 496
3	3	Nut		601 222 471
4	1	Sleeve		601 222 472
5	2	O-ring		300 012 668
6	1	Lifting tip dry hole		601 222 473

11. Overshot for Pumping In



Overshot for pumping in has part no. 601 222 458.

The numbers bellow correspond against the numbers in table “List of spare parts, Overshot for Pumping In, WL76” on page 25.

The overshot has a swivel (4, 5, 7, 8, 9) in its upper end, which prevents the wire from twisting. A safety device [shear pin (3)] is built into the swivel and is intended to break at approximately 1.5 tons. This is to eliminate the risk of a cut wire being left in the hole.

The wire is fitted in the wire clamp (1) and locked with three stop screws (2).

Axial ball bearing is installed with washer and LOC-King nut. It should be tightened so that a gap (0.5 mm) exists between the draw bar (4) and Nut (5). It should be able to swivel easily. Then fill the space with grease before it is attached to the steel bar. After that the wire clamp with shear pin can be mounted.

The shear pins (3) should be replaced at regular intervals.

The seals (10) are mounted on the spacer bar (12), on each side of the spacer tube (11).

The seal on the overshot for the pumping in seals to the drill rod. This means that a check should be made to see that the drill rods are free from rust on the inside and that no rod joints are damaged. Rusty or damaged rods will damage the seal.

Finally the lifting tip is fitted and locked with the tubular pin (13) 8 x 50.

When the lifting tip (14) is led down in the core barrel head the latches are released from the latching ring. When the tip has passed the latches the inner tube is locked to the overshot, and the inner tube can be winched up by means of the wire.

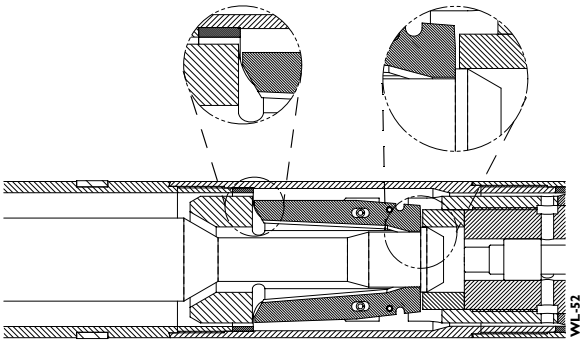


Figure 5. Core barrel head

Note

When the edge of the lifting tip begins to be worn it should be replaced.

11.1 List of spare parts – Overshot for Pumping In 601 222 458

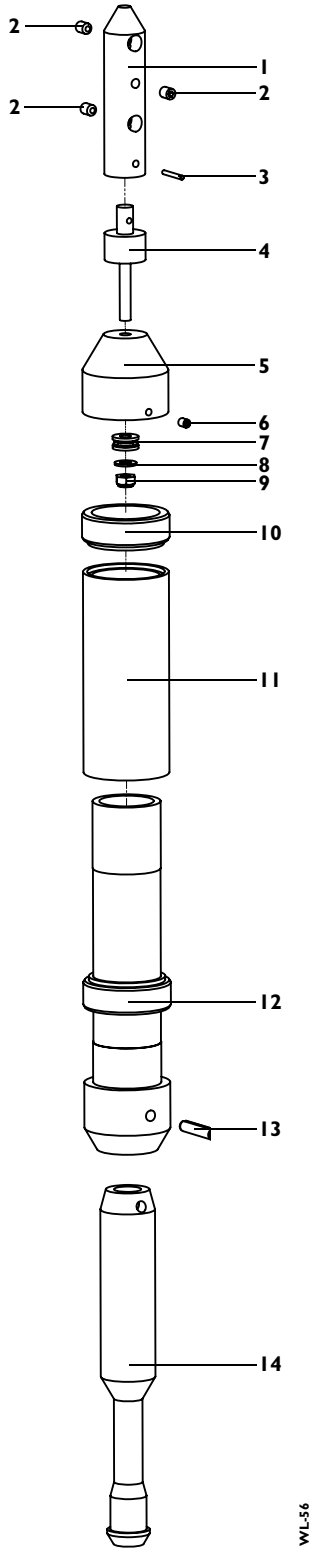
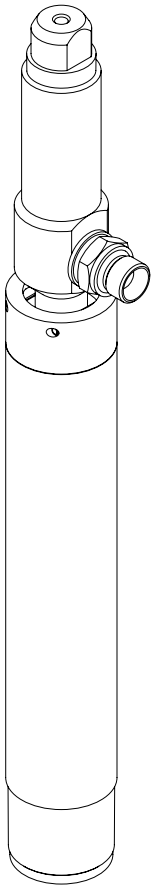


Table 17: List of spare parts, Overshot for Pumping In, WL76

No.	Quantity	Part	Remarks	Part no.
1	1	Wire clamp		601 222 456
2	3	Stop screw		300 027 148
3	1	Shear pin		300 025 423
4	1	Draw bar		601 222 461
5	1	Nut		601 222 453
6	1	Stop screw		300 012 534
7	1	Axial ball bearing		300 027 123
8	1	Washer		300 015 269
9	1	Nut		300 012 510
10	2	Seal ring		601 222 454
11	1	Spacer tube		601 222 455
12	1	Spacer bar		601 222 457
13	2	Tubular pin	8 x 50	300 015 949
14	1	Lifting tip		601 222 440

12. Stuffing Box



WL-14

Stuffing box has part no. 601 222 844-X.

The stuffing box can be fitted directly on the drill rod by screwing it on by with a pair of tongs.

We recommend that the sealing box, water hose, pump-in overshot and a 750 mm drill rod are fitted together to form a single unit, a “loading tube”. This simplifies handling when retrieving the inner tube. The loading tube can be screwed on the drill string by means of the machine as soon as the water swivel tube has been removed. The water is connected as per “Figure 6. Proposal for water handling” one page 26.

The stuffing box is designed so that the drill string can be rotated during the pumping.

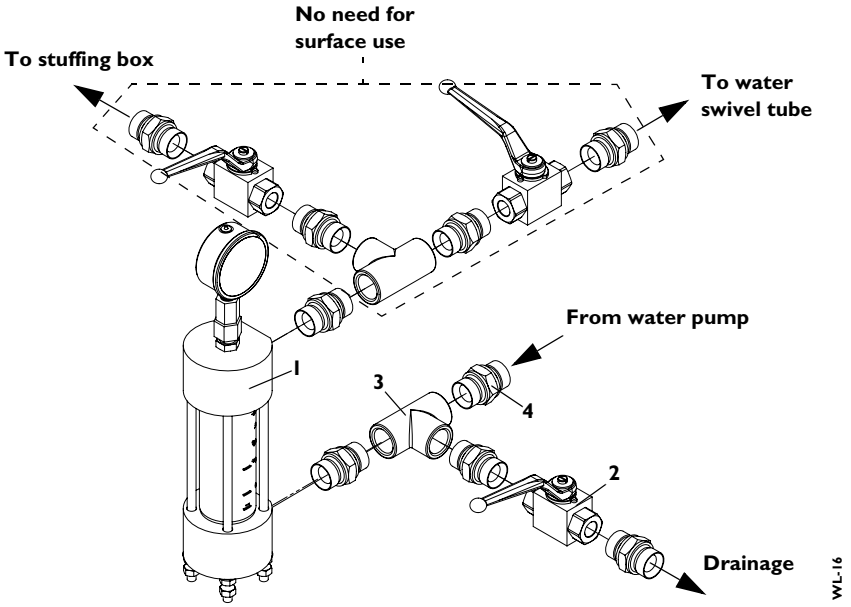


Figure 6. Proposal for water handling

Table 18: List of spare parts, Proposal for water handling 803 908 128

No.	Quantity UG/S	Part	Remarks	Part no.
1	1/1	Flow meter		803 908 127
2	3/1	Shut off valve	3/4"	300 013 228
3	9/5	Adapter	3/4"-3/4"	300 013 051
4	2/1	T-adapter	3/4"	300 013 133

12.1 List of spare parts – Stuffing Box 601 222 844-X

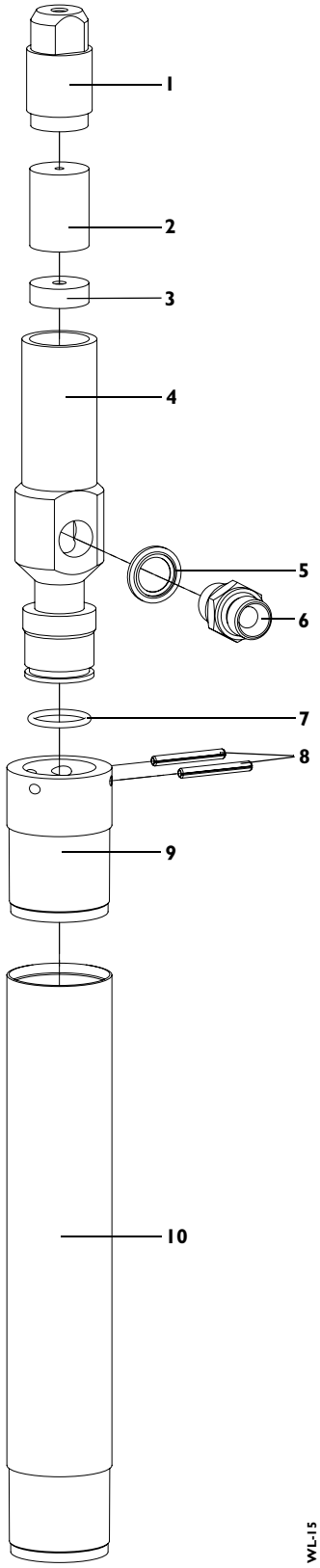


Table 19: List of spare parts, Stuffing Box

No.	Quantity	Part	Remarks	Part no.
1	1	Screw		See Table 20 on page 27
2	1	Seal		See Table 20 on page 27
3	1	Spacer		See Table 20 on page 27
4	1	Seal housing		601 222 635
5	1	Tredo washer		300 012 614
6	1	Adaptor		300 013 048
7	1	O-ring	29.2 x 3.0	300 012 691
8	2	Tubular pin	5 x 40	300 020 641
9	1	Connector		601 222 843
10	*	Drill rod	L = 750 mm	501 222 711

* Not included in “Stuffing box, complete”

Table 20: Stuffing Box, complete

Wire mm	Screw	Spacer	Seal	Stuffing box
4.4 (11/64")	601 222 638-1	601 222 637-1	601 222 499	601 222 844-1
4.8 (3/16")	601 222 638-2	601 222 637-2	601 222 501	601 222 844-2
6	601 222 638-3	601 222 637-3	601 222 543	601 222 844-3

13. Wireline 76/57, Component Parts

Drill bit 76.0-57.5/triple 76.0-51.0, Reaming shell 76.3, Drillrod 73.2-64.4 mm

Table 21: Wireline 76, component parts

Part	Part no. Outer tube	Part no. Innertube	Part no. Complete
Core barrel, complete 1500	601 222 610	601 222 614	601 222 444
Core barrel, complete 3000	601 222 611	601 222 615	601 222 445
Core barrel, complete 4500	601 222 612	601 222 616	601 222 446
Core barrel, complete 6000	601 222 613	601 222 617	601 222 447
Core barrel, complete with guides 3000	601 222 605	601 222 615	601 222 797
Core barrel, complete with guides 4500	601 222 606	601 222 616	601 222 798
Core barrel, complete with guides 6000	601 222 607	601 222 617	601 222 799
Core barrel, complete triple x 1500	601 222 610	601 222 618	601 222 475-3
Core barrel, complete triple x 3000	601 222 611	601 222 619	601 222 475-4
Core barrel, complete triple x 4500	601 222 612	601 222 620	601 222 475-5
Core barrel, complete triple with guides 3000	601 222 605	601 222 619	601 222 800
Core barrel, complete triple with guides 4500	601 222 606	601 222 620	601 222 801
Core barrel, complete triple front flushed 1500	601 222 610	601 222 629	601 222 802
Core barrel, complete triple front flushed 3000	601 222 611	601 222 630	601 222 803
Core barrel, complete triple front flushed 4500	601 222 612	601 222 631	601 222 804
Core barrel, complete triple front flushed with guides 3000	601 222 605	601 222 630	601 222 805
Core barrel, complete triple front flushed with guides 4500	601 222 606	601 222 631	601 222 806

Part	Part no.
Core barrel head, complete WL76	601 222 595
Core barrel head, complete, triple WL76	601 222 602
Overshot for downward hole, complete	601 222 685
Ball joint complete	601 222 462
Safety lowering device for dry holes	601 222 448
Overshot for pumping in, complete	601 222 458
Stuffing box for pumping in, complete	601 222 844-X
Water swivel	501 012 143-2
Adapter water swivel	501 222 725
Drillrod WL76, 73 x 750 mm	501 222 711
Drillrod WL76, 73 x 1500 mm	501 222 712
Drillrod WL76, 73 x 3000 mm	501 222 706
Gauge for drillrod WL73	601 222 485-3
Adapter drillrod WL73 pin x 50 box	501 222 724
Adapter drillrod WL73 pin x 72 box	501 222 743
Adapter drillrod WL73 pin x WL63 box	501 222 796
Adapter drillrod WL73 box x 50 pin	501 222 726
Adapter drillrod WL73 box x 72 pin	501 222 781
Recovery kit	501 217 110
Cuff wrench WL76 outer tube	501 115 032
Cuff wrench WL76 inner tube	501 115 030
Tool kit, including:	601 222 459
- Hex key 2, 3, 4, 6 mm	
- Pin punch Ø3, Ø4, Ø8 mm	
- Hook wrench Ø38, Ø58 mm	
- Sleeve 11, 13, 14, 21, 22 mm, connection 1/2"	
- Long screwdriver	
- Tool bag	
- Assembly tool	601 222 484-3
Wrench for inner tube connection	601 222 590-1
Hand reamer for valve housing	300 025 325

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14. Recovery kit-Component Parts 501 217 110

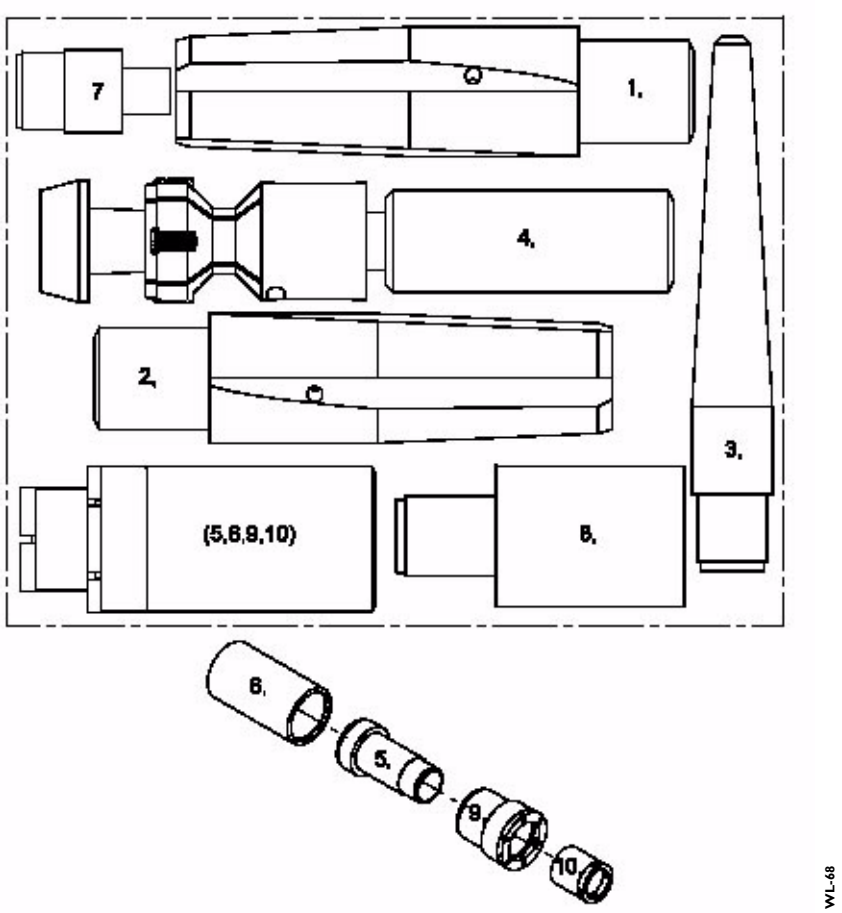

Table 22: Recovery kit 501 217 110

No.	Quantity	Part	Part no.
1	1	Drillrod tap WL73 RH connection 50 box	501 217 092
2	1	Drillrod tap WL73 LH connection 50 box	501 217 092-V
3	1	Lifter rod Ø42 mm RH connection 42 pin	501 217 007
4	1	Drillrod tap, expanded WL73 Drillrod	501 217 104
5	1	Extension tube, recovery kit	501 217 103
6	1	Sub WL73 box x Z 76 box	501 217 100
7	1	Sub 50/48 pin x M24 x 1.5 pin	501 222 741-3
8	1	Sub WL73 box x 50 pin	501 222 726
9	1	Drill bit Z 76	100 022 452
10	1	Drill bit 54/43	100 024 585
11	1	Tool bag	300 027 167

14.1 Recovery Operation

Every core driller will sooner or later experience the situation when drilling tools are either broken down or stuck in the hole. In such cases no drilling can proceed before the string is recovered.

14.2 Reasons of breakage

14.2.1 Wear

Drill rods and other exposed parts of the drill string wear against the hole wall during drilling. The cuttings in combination with flush water will also contribute to this wear. The rods will wear down to a point where they will not be able to resist the torques nor the longitudinal forces they are exposed to.

14.2.2 Fatigue

Drill rods and drill bits are constantly exposed to heavy loads and forces. The life of the equipment is limited by its fatigue resistance. If the nominal life of the drill string is exceeded the risk of breakage is rapidly increased. The life can be considerably reduced if the through faulty usage or maintenance. Heavy deviation of the drill holes also reduces life of the drill string due to the combination rotation/bending.

14.2.3 Getting stuck

Common cause of getting stuck:

1. Poor evacuation of cuttings. The cuttings from the bottom of the hole has to be transported to the surface by means of flush water. Too low flush speed makes the cuttings pack up against the drill rods which ultimately will result in getting stuck.
2. Leakage of the drill rod joints makes the flushing of the lower part of the drill string insufficiently flushed.
3. Cracks and fractures in the rock may result in loss of flush water. Hence the cuttings will cease to move upwards and it will sediment in the hole. Cracks may also cause the drill bit to get stuck during drilling.
4. Lack of flush water due to faulty water pump or operator error. The drill string will get stuck in a matter of seconds due to melting of the drill bit.

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14.3 First thing to do when...

14.3.1 ...drill string is broken (cut off) down the hole

The drill string still attached to the drill unit is taken out of the hole. The breaking point is studied and suitable method is then chosen to recover the drill rods still down in the hole.

14.3.2 ...core barrel or drill bit is so badly stuck that they can not be removed by the drill unit

The tools stuck in the hole can be drilled (cleaned) away with drill bits.

Swiveled parts stuck in the hole will rotate and therefore it may sometimes be nessesary to pour cement down the hole prior to the cleaning.

14.3.3 …the whole drill string is stuck in the hole due to sedimentation or cave in

It may be possible to save the drill string by drilling over it with a larger dimension.

14.3.4 ...tools have fallen into the hole

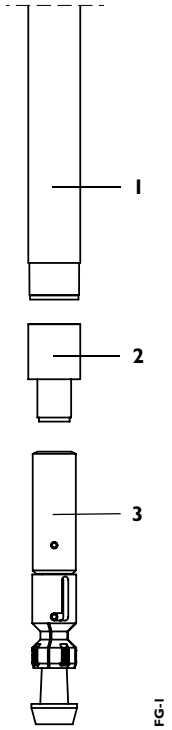
The two most common methods are to lower recovery tools — usually specially made for the specific purpose — or to drill away the tools.

14.3.5 …wire and hoses have snapped down the hole

It is usually possible to lower a ”spear” with hooks and rotate it. This will cause the hose/wire to twine around the spear.

14.4 Expanding recovery tap

The expanding recovery tap should be used if one of the drill rods is cut off in the hole. It is also an alternative when a drill string or parts of it is dropped down the hole and can not be “picked up” by remaining drill rods. The expanding recovery tap is a recovery tool for pulling up drill rods stuck in the hole *without rotation*. It should be not be used for unscrewing drill rods.

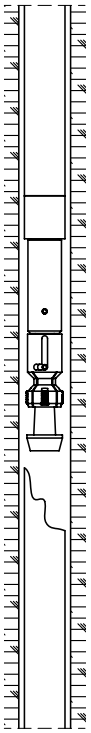


1. Assembly

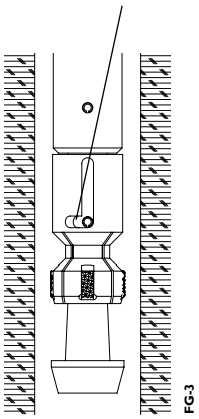
The expanding recovery tap is attached to drill rods of the same dimension as the string stuck in the hole. An adaptor shall be used in between the drill rod and the expanding recovery tap.

Table 23: Expanding recovery tap parts

No.	Part
1	WL Drill rod
2	Sub
3	Expanding recovery tap



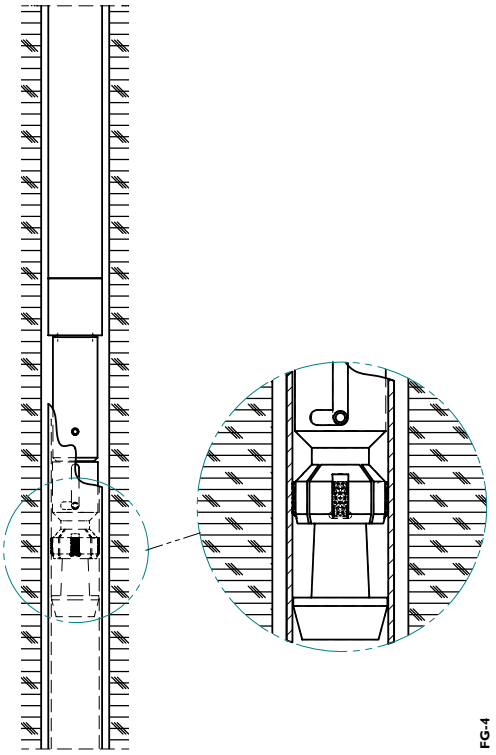
The expander is turned until the steering pin is in a position which will enable the expander to move up and down.



Lowering position

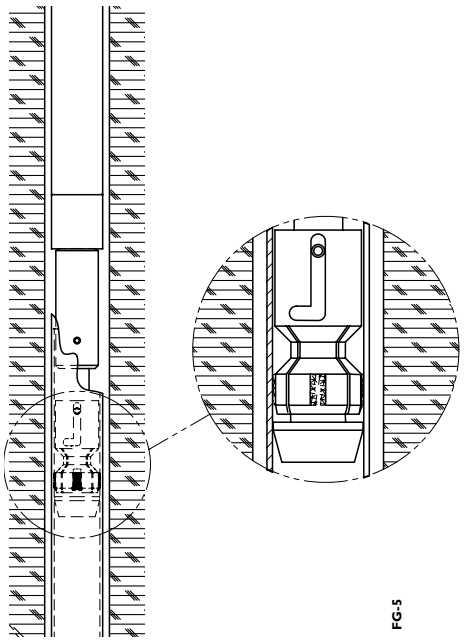
2. Lowering

Before the lowering of the tool, the expander should be fixed in “lowering position”.



3. Lowering towards the “lost” drill rods

The expanding recovery tap is inserted a maximum of 250 mm into the “lost” drill string.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4. Recovery of the "lost" drill string

When the recovery tap shaft is being pulled backwards it will make the lower part expand inside the "lost" drill string.

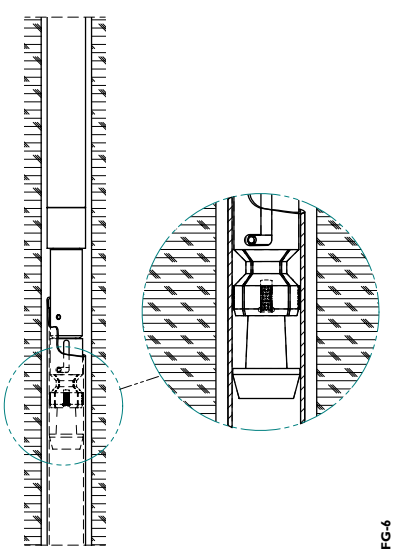
Table 24: Maximum pulling force without rotation

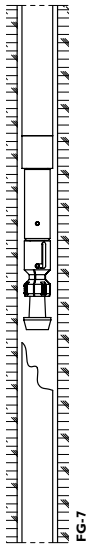
	WL46	WL56	WL66	WL76
Pulling force (kg)	8000	12000	20000	24000

Note

Do not rotate the drill string when the tool is being pulled back.

It may happen that the drill string is so badly stuck that the expander slides out of the drill string. In such a case another recovery tool should be used.


FG-6

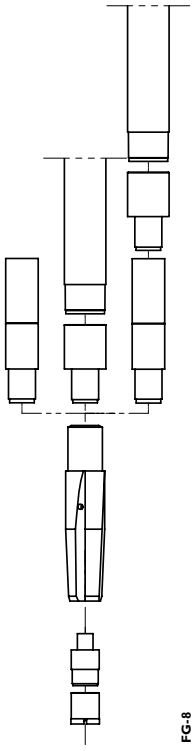

FG-7

5. Release of the expanding recovery tap

If max allowed pulling force is reached, the expander should be released. This is done by pushing forward and turning the (fishing) drill string 30° RH-turn (see the picture to the left).

The expanding recovery tap can now be released and the next recovery alternative should be tried.

14.5 Recovery taps



The recovery tap should be used when a drill string is stuck or broken in the hole and when attempts to recover with the expanding recovery tap have failed. There are two types of recovery taps – one right hand threaded (RH) and one left hand threaded (LH). The right handed tap can be attached to three different set-ups of drill rods:

1. The existing drill string. With this set-up it is possible to screw the recovery tap only as far down the (stuck/broken) drill rod as the adaptor on top of the recovery tap permits. If the edge of the adaptor has reached the broken drill rod without the recovery tap gripping, another method of recovery must be used.
2. Using a smaller O.D. drill rod in between the existing drill string and the recovery tap. In this way the recovery tap is permitted to go deeper inside the (stuck/broken) rod.
3. Using a smaller O.D. drill string whose threads fit directly with the recovery tap.

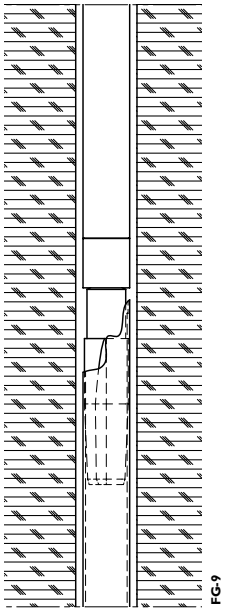
Table 25: Drill rod for the different systems

	WL46	WL56	WL66	WL76
Drill rod	33.5	33.5	50	50

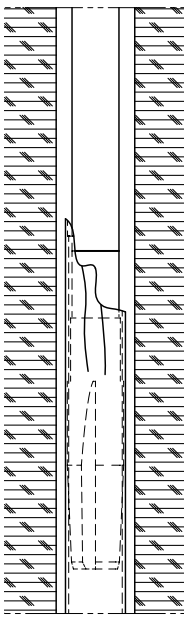
The RH recovery tap can be combined with a Z-cleaning bit to drill clean the hole from caved in rock.

The left handed (LH) tap is for recovering drill rods one by one when attempts to pull out the drill string have failed. These rods may not be stuck themselves, but joint with the drill rod or core barrel that is stuck deeper down in the hole. As the un-screwing is done with left hand rotation, the LH-tap requires a left hand (LH) threaded drill string. The LH tap can not be combined with the Z-cleaning bit that is included in the recovery kit.

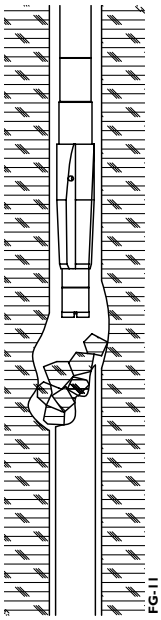
Alternative 1



Alternative 2 and 3

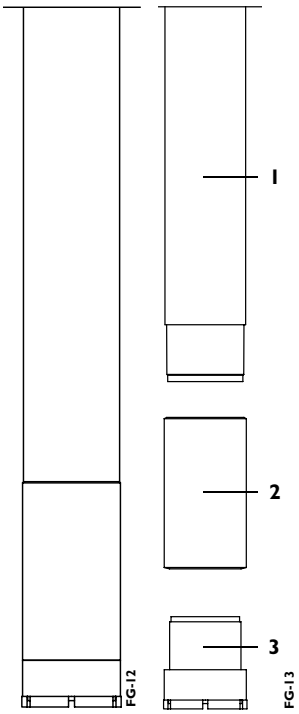


Recovery tap with Z-cleaning bit



14.6 Cleaning of drill hole

When tools are so badly stuck that they can not be recovered from the hole, a cleaning bit (Z) should be used to drill these tools away. In some cases it is necessary to pour cement in the hole to stop swivelled parts such as a core barrel head from rotating when the Z-bit is used.

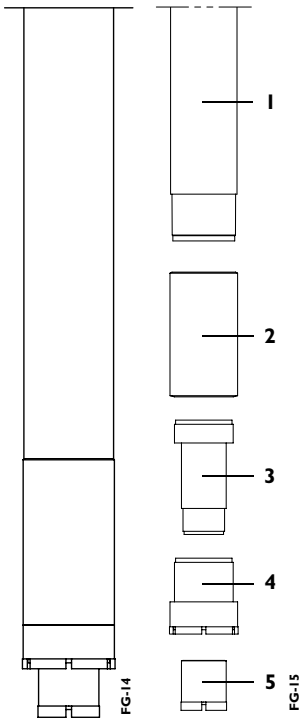


The cleaning bit is attached onto the WL drill rods by means of a sub.

If there is a problem with vibrations, there are specific drill rods (Z-drill rods) that can fitted directly on to the Z-bit.

Table 26: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Z-cleaning bit



The Z-cleaning bit can be combined with another drill bit if it becomes necessary to increase the cutting area to cut away the broken tools.

Table 27: Cleaning of drill hole parts

No.	Part
1	WL-drill rod
2	Sub
3	Extension rod for TV Z bit
4	Z cleaning bit
5	TV Z bit